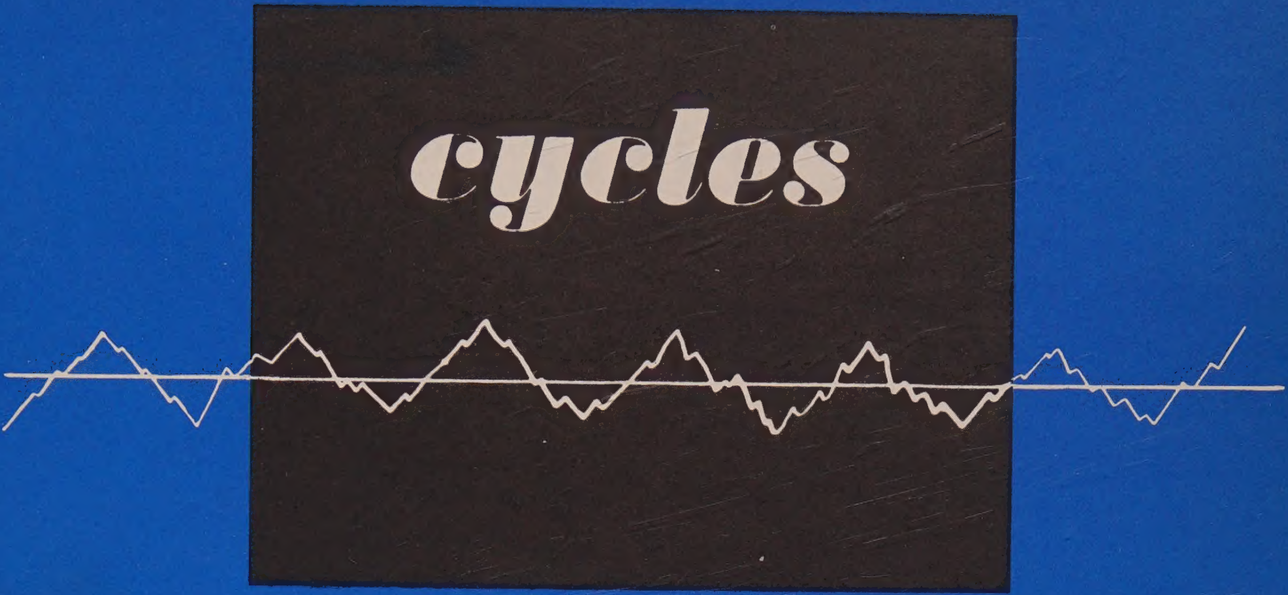
cycles



January 1959

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THE OFFICIAL BULLETIN OF THE FOUNDATION FOR THE STUDY OF CYCLES

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Because of space limitations this issue does not contain a "Cycle Round-Up" section. However, the "Round-Up" will be back in its place next month.

Program

Our program is: (1) *to collect* as many examples as possible of rhythmic fluctuation in all fields of natural and social science, (2) *to measure* each of these rhythms with the greatest possible accuracy, (3) *to record* the latitude, longitude, wave length, wave shape, timing, and strength of each cycle in such a way that any qualified worker can reproduce the work and obtain the same results; and so that anyone can if he wishes, take issue with the methods used by the worker to isolate, definitize, and evaluate the cycle, (4) *to stimulate* and help others to do these same things, (5) *to print* the results of all this research, (6) *to arrange,* collect, catalog, and group the cycles thus discovered and definitized, (7) *to discover the laws* which govern the operation of cycles, and (8) *to deduce the cause* or causes of cycles.

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Director's Letter

Dear Member:

The Creation of the Universe

The other day, on the bus from Washington to New York, I read a book that gave me quite a thrill. It enlarged my horizons. It made me realize more than ever the grandeur of the universe—a grandeur of which cycles is only a very small part (but still a part). This book also mentioned a few cycles that were new to me.

I commend the book to you. It is called *The Creation of the Universe*. It is by George Gamow (pronounced Gamov), a world-famous nuclear physicist of George Washington University. It is a Mentor book. It can be bought, for 55¢ postpaid, from The New American Library of World Literature, Inc., 501 Madison Ave., New York 22, New York; or for 50¢ from any bookstore. I bought my copy from the newstand at the bus station. You might like to buy one too.

Gamow presents the concept of those scientists who believe that we are part of an expanding universe. I have met Gamow and have a high regard for him.

The Big Squeeze

If, mentally, we reverse the process of expansion, we reach a point about 3.5 billion years ago when the universe was at a highly compressed state. It is thought that (to quote Gamow) "the Big Squeeze, which took place in the early history of our universe, was the result of a collapse which took place at a still earlier era, and that the present expansion is simply an 'elastic' rebound which started as soon as the maximum permissible squeezing density was reached . . . .Most likely the masses of the universe were squeezed together to such an extent that any structural features which may have existed during the 'precollapse era' were completely obliterated, and even the atoms and their 'nuclei' were broken up into the elementary particles (protons, neutrons, and electrons) from which they are built." (Primordial chaos.)

The Explosion

When the maximum possible density (and temperature) was reached there was a gigantic explosion that reversed the process and started things expanding again.

At the time of this explosion all the matter of the universe was concentrated into a ball about 30 times as big as our sun. The temperature was billions of degrees. The density was so great that a cubic inch of matter weighed sixteen hundred million tons. At this density all the matter of our earth would have been compressed into about a cubic mile.

The atoms were formed from the expanding matter within about an hour of the original explosion. Then nothing of particular interest happened for the next 30 million years. The hot gas, consisting of the newly formed atoms, continued to expand; graudally its temperature became lower and lower. Eventually, when it was cool enough, this gas condensed into fine dust. This dust then condensed into galaxies, stars, planets, moons, and here we are!

Will We Contract Again?

Will we contract again? Gamow says no. He says the rate of expansion is so great that gravity can not catch up with it. On the other hand the latest work, released within the week, of the giant 200-inch telescope at Palomar suggests that the rate of expansion is lessening. And Gamow himself speaks of the "collapse" that preceeded the explosion, and the "rebound" that followed.

If it should ultimately turn out that the universe is alternately contracting and expanding in a rhythmic cycle billions of years long, we would have the granddaddy of all cycles.

In passing I might mention that Gamow thinks of creation not as making something out of nothing, but rather as making something shapely out of shapelessness. In a way, isn't that what all of us are trying to do?

The Marvel of it All

The thing that is so marvelous to me is (1) the size and (2) the complexity of the universe. The size and complexity are even more magnificent when you realize the simplicity from which it all originated. You see the same thing, of course, when an acorn unfolds into an oak tree, but you are used to that. For me, to realize that all the complexity of my living room for example—all the pattern, all the color, all the form, ceramics, textiles, metals, woodwork, air—grew out of a speck of simple substance smaller than a pin point, is startling.

As long as I have spoken of a 50-billion-year cycle, I wonder if I hadn't better emphasize how big a billion is? It would take 300 hundred-pound sacks to hold a billion grains of rice!

On a clear night, with the naked eye, you can see about 6,000 stars, each a flaming ball like our sun. You can hold this number of grains of rice in one hand. There are over 100 billion stars in our galaxy. Thus, with every star represented by a grain of rice, it would take over 40 railroad cars to hold the pile! And our galaxy—which rotates in a cycle 200,000,000 years long is only one of a *billion* such enormous *swarms* of stars, each rotating slowly in a cycle of its own. Quite a place we live in, eh what?

A Model

A number of years ago, when I taught Sunday School, I used to try to visualize things for my class in this way: I used a large pea, a quarter of an inch in diameter, to represent the earth. A radish seed, about 9 inches away, represented the moon. On this scale the sun would be a ball about 30 inches in diameter, located 279 feet away. Mercury and Venus would be peas spining around the sun, between the sun and the earth. Outside the earth's orbit Mars would be another pea, 423 feet from the sun, then Jupiter, the size of an orange, 1/4 mile away; Saturn, another orange, would be half a mile; Uranus, a plum, a mile; Neptune, another plum, a mile and a half; Pluto, a pea, at two miles. To lay out the whole system would take a field four miles square. Then of course, in addition, to make things complete, you would have to add the asteroids, the comets (an estimated 20 billion of them), and the various moons, each with their cycles of rotation and their cycles of revolution.

On this same scale (1 yard corresponding to 1,000,000 miles) the *nearest* star would be 14,000 miles away!

As you doubtless know, our galaxy is shaped like a disk. Its greatest diameter (on the scale of 1,000,000 miles to a yard, used above) would be over 3 1/2 times the real distance to the sun. The thickness of our galaxy is about 1/10 of its greatest diameter.

The whole universe, as far as we now know, consists of about a billion *galaxies*, with distances between them hundreds of times their diameters!

Most of the galaxies are rotating in cycles, Each is filled with stars rotating and revolving, and in many cases pulsating, in cycles. Each star is probably surrounded by planets revolving and rotating in cycles. Many of the planets are accompanied by moons, also revolving and rotating in cycles!

Shall we get back to something simple, like the cycles here on earth?

The Problem

What is the main problem in connection with terrestrial cycles?

I can answer this question by stealing a line from the Plymouth Colony Foundation. This organization is trying to rebuild the original Mayflower village as it was in 1630. As I happen to be descended from William Bradford, governor of that colony, I am on their list of possible donors. In the last release they said—and this goes for us too—

"We have no problems that $650,000 wouldn't solve!"

Cordially yours,

Edward R. Dewey

Director

Postscript

P. S. Speaking of money reminds me that every once in awhile I get letters telling me how "noble" I am to work for the Foundation without salary.

These letters embarrass me because I am not noble at all. I don't work without salary because I *want* to, but because there isn't any money to pay me!

Also it isn't strictly accurate that I work without salary. The exact situation is as follows:

In 1951, 1952, 1953, 1954, and 1955, I drew no salary. However, in 1956 I got $1,440 back salary for each of these five years.

As this is being written (November 28th) I have received no salary for 1956, 1957, or 1958. However, we may end 1958 with a surplus. If so, I may be able to get some salary for these years also.

Don't give me any credit. The plain truth is I have a bear by the tail!

Research by Staff

WHAT'S AHEAD FOR MANUFACTURING PRODUCTION? A SHORT TERM VIEW

BY G. SHIRK

If there is validity to the approach used in this analysis, 1959 should be a fairly good year for manufacturing production.

In our work we usually adhere to the hypothesis of rigid cycles. In this instance, however, we are using long-term rigid cycles only as the background against which the current short-term and possibly dynamic cycles are operating.

A rigid cycle is one that, ideally, does not change either its length or strength. Its irregularities are caused by random forces or other cycles. A dynamic cycle on the other hand is one that is not trued up (timed) by anything outside itself. It is caused by excesses of action and reaction. It is inherently *irregular* and hence not predictable except in a general way.

Getting into dynamic cycles is like opening Pandora's box, but here we have a fairly clear example, Moreover, because it is a current cycle, we can follow its operation from month to month.

Cycles in Manufacturing Production

A dynamic cycle in manufacturing production is caused by the functioning of business itself. It could be the expansion and contraction due to the accumulation and depletion of inventories, for instance, or by any of a number of other factors. Such a cycle would *not* be rigid either in timing or amplitude and its future behavior would therefore *not* be reliably predictable.

Figure 1

There are three parts to Figure 1. First, there is the monthly record of recent manufacturing production, which is the Federal Reserve Board's Index. The Index is recorded by the heavy black line.

Second, there is a drawing of the basic underlying structure of manufacturing production as tentatively determined earlier this year. This line shows only the yearly levels and is drawn as a broken line. Third, there is superimposed a short, possibly dynamic, cycle of accumulation and depletion. The cycle is the thin zig-zag line. Note that the length and strength of this cycle are not regular and hence can only be guessed at for the future.

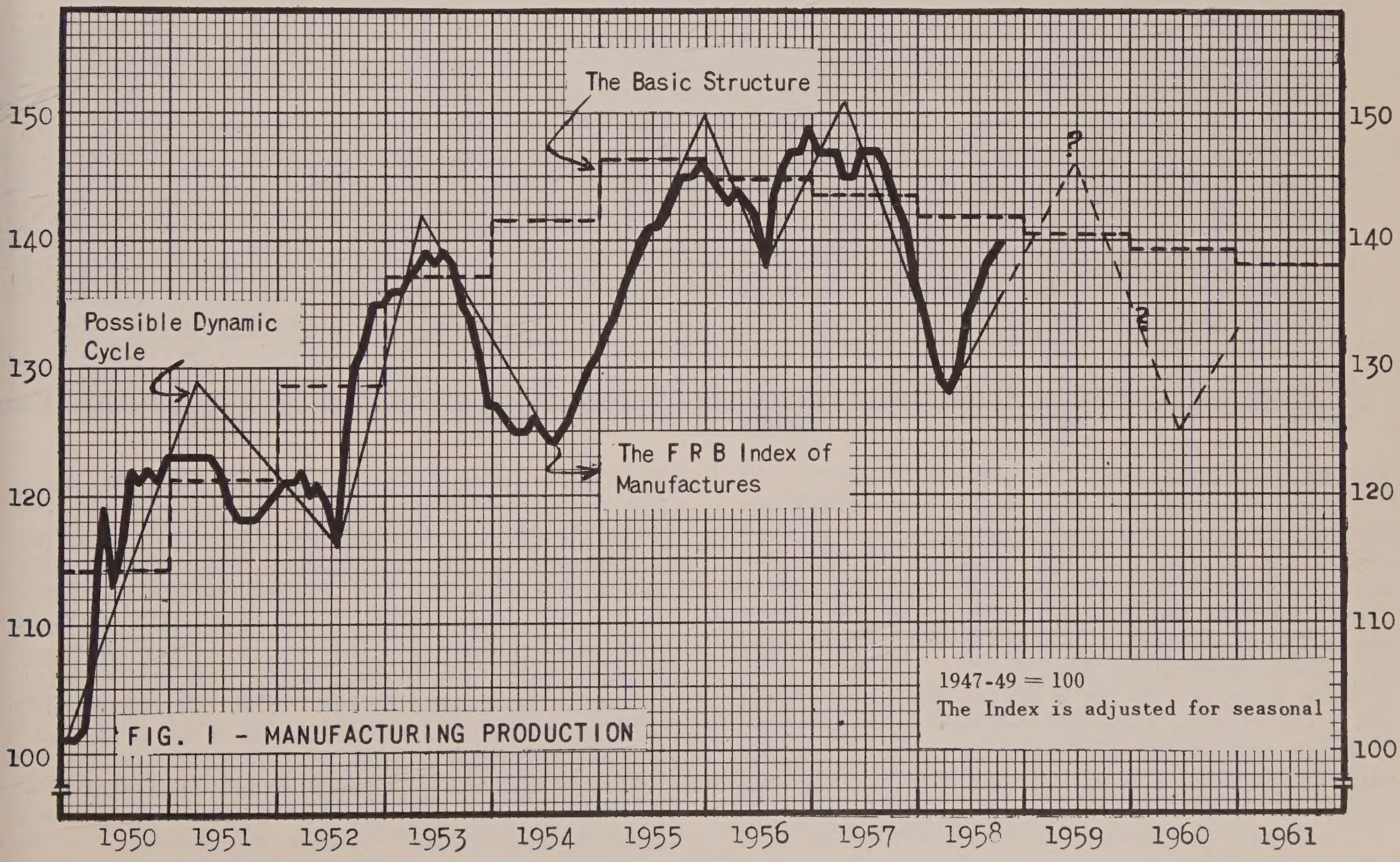
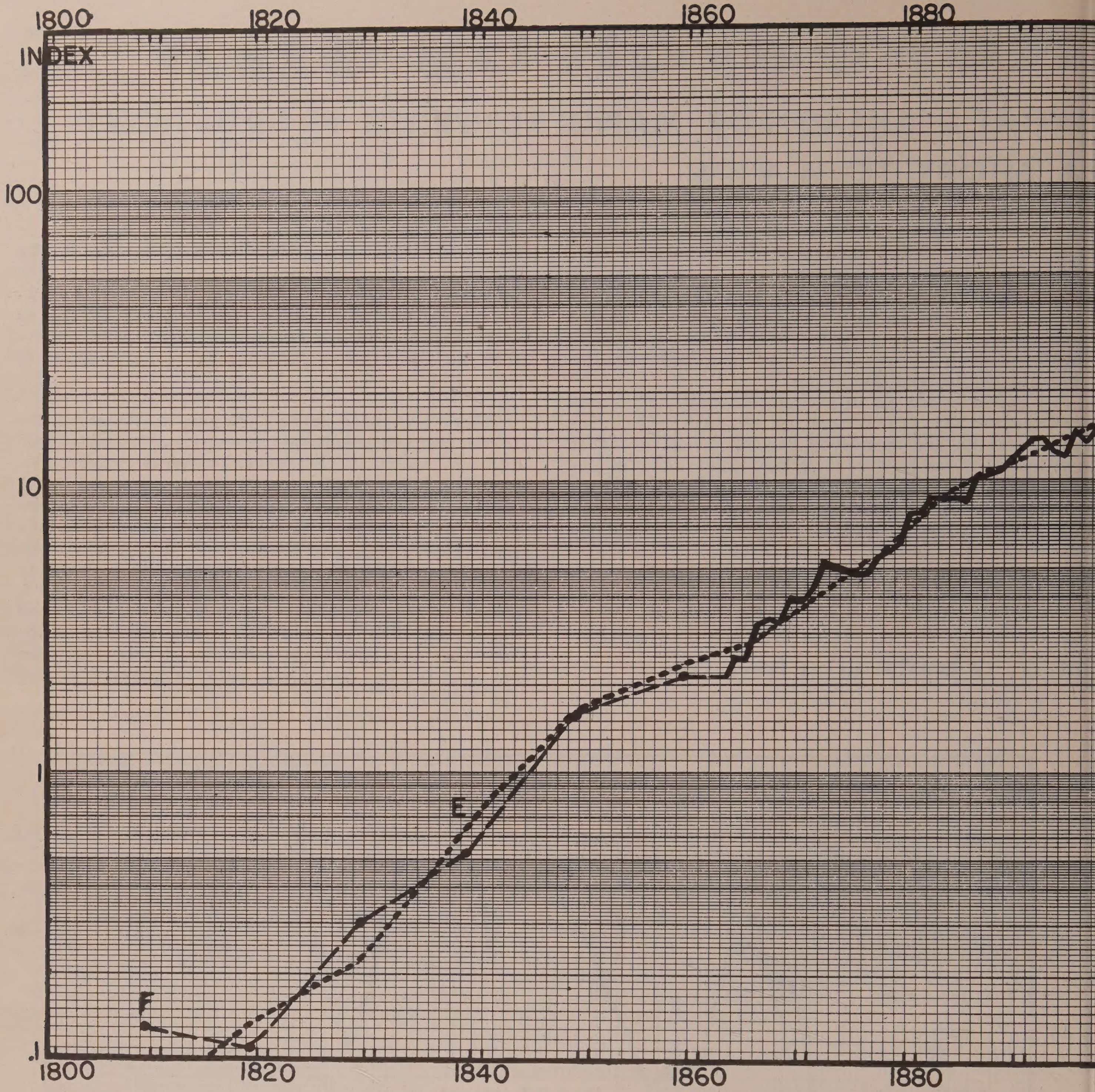


FIG. I - MANUFACTURING PRODUCTION

1947-49 = 100
The Index is adjusted for seasonal



The Basic Structure

Figure 2 which is given above summarizes our conclusions about the underlying structure of manufacturing production. The combination of a 50-year cycle with a 36-year cycle and the growth trend explains the general contour of the whole record of manufacturing production. We have covered this basic analysis in past reports.

Bear in mind that in a series of figures only 150 years long we have not had enough repetitions of these long cycles to be sure of their significance. Even so, we depended upon them enough last spring to assert, amid all the calamity howling, that we would *not* have a major depression at this time. Here is what we said (May-June 1958, page 113):

"If the 36- and 50-year cycles isolated from the manufacturing production figures from 1810 to date have significance, and if they continue, the quantity of goods manufactured in the U.S.A. will (barring war) more or less stabilize for the next fifteen years or so. This situation could bring on a major depression in the '70's, but, by itself, would not seem likely to bring on a major depression at the present time."

Last April, when it was written, that statement ran counter to all the forecasts, but it was right. We did *not* have a major depression.

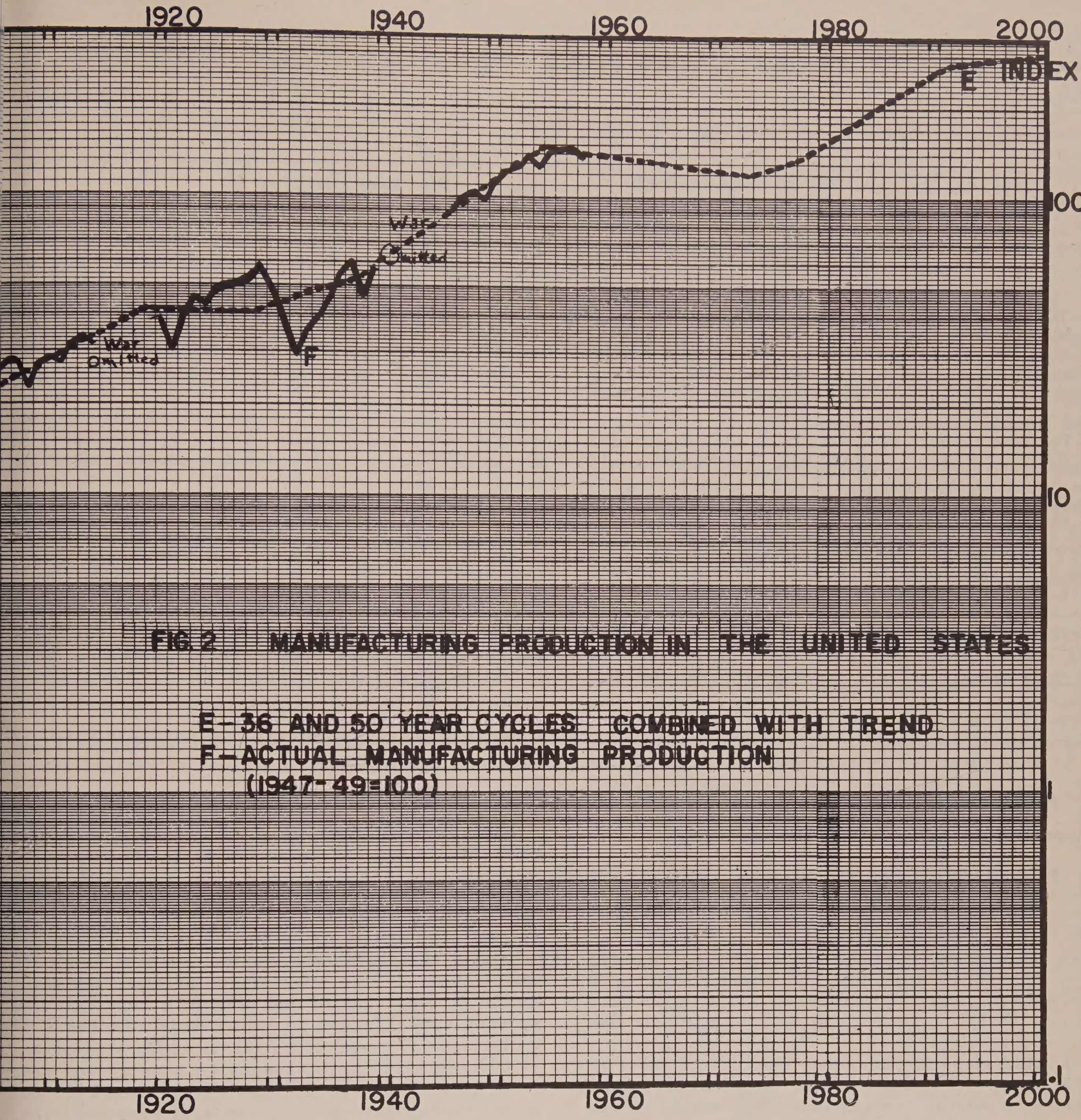


FIG. 2 MANUFACTURING PRODUCTION IN THE UNITED STATES

E—36 AND 50 YEAR CYCLES COMBINED WITH TREND
F—ACTUAL MANUFACTURING PRODUCTION
(1947-49=100)

Of course, the article in the May-June issue was not talking about the various wiggles that constantly disturb the economy. It was speaking only of the board, rolling sweep of the line of manufacturing production over the long term.

The Short Cycle

It is the very short-term moves which disturb people, and get the headlines.

If the short cycle shown on Figure 1 is a dynamic cycle it is predictable only in very general terms—it's going up or it's going down. Right now it is going up. It may go up for another several months. The next little low (barring war) may come sometime in 1960.

However, the underlying structure of the series suggests, as it did a year ago, that any dip in the immediate future is likely to be relatively minor, and of relatively short duration.

On Figure 1 you will observe that while the line of the basic structure was going up toward the 1955 peak, the lows in the short cycle were progressively higher. This situation no longer exists. However, for the immediate future the level of the basic structure remains high. This basic strength should put a floor under the next short-term dip. The fact that it is level should put a ceiling above the current rise.

SOME BASIC CYCLE CONCEPTS

By Edward R. Dewey

I think—as a result of almost 22 years of study—that we must reconcile ourselves to two facts: one, that some cycles are of variable wave length and two, that even meaningful cycles sometimes fade out and disappear.

Of course you could argue that if a cycle is of varying wave length, or if it disappears after a while, it isn't a meaningful cycle. This is merely a matter of definition. It corresponds to the thought of the old Ptolemaists who argued that the planets moved in circles (not ellipses) because they "ought" to.

The real trouble with admitting that meaningful cycles could have varying wave length and could disappear is that it is so much harder to distinguish meaningful from accidental cycles if we admit the significance of these irregularities. The greater the irregularity the easier it is for the given behavior to be the result of chance. That is why, for many years, I rejected the study of cycles that did not seem to be the result of perfectly regular forces that had always operated and always would operate. Such limitation of field is certainly the safer course to pursue, but I have come to believe that we need to widen our study if we are to learn all we need to know about cyclic behavior.

At this point let me call your attention to the fact that the expression "variation in wave length" has two meanings.

Average Wave Length May Change

One meaning refers to the fact that, on the average, the wave length may change. For example from -160 to +677 the average length of the sunspot cycle seems to be 11.17 years; from +677 to 1526 the average length seems to be 11.02 years, Over the whole span of 1687 years the length averages 11.094 years (see an article on this subject that I wrote for the *Journal of Cycle Research* for July 1958).

I could give you many other examples of variable wave length. The length of the day, measured from sunrise to sunrise, varies in a cycle which, on its part, is exactly one year long. The click of a stone caught in the tire of your car is of constant wave length as long as your car goes at a constant speed, but the intervals will speed up or slow down as you accelerate or decelerate. The time intervals between successive angular distances traveled by a planet will vary as the planet goes around the sun. This is because a planet travels at different speeds in different parts of its orbit. (This, in turn, is so because its orbit is an ellipse instead of a circle.) Even the length of the day changes slightly (by one-thousandth of a second per century) and so does the time from one full moon to the next (by one-eighth of a second per century).

Successive Waves Differ

The other meaning of the term "variable wave length" has to do with the fact that, as everyone knows, the length of successive waves differ. The question is, is there an *inherent* difference in wave length, or is the difference the result of perfect regularity distorted by randoms or other cycles?

For example, Fig. 1, Curve C, shows the combination of a perfectly regular cycle (Curve A) and a series of random numbers (Curve B). If you remove the regular cycle (Curve A) from Curve C the residue is Curve B which (by construction) is purely random.

On the other hand consider Fig. 2, Curve A. In this chart the manifest curve (the curve you see) has been drawn in such a way as to show a rhythm which, end to end, on the average, is 11 items long. If you average all these waves you get the average cycle which is shown by Curve B. If you adjust Curve A for Curve B you get as a residual Curve C which shows almost as much rhythm or beat as the original Curve A. Fig. 2 illustrates a cycle where there is an inherent irregularity in the wave length of the cycle.

When I speak of the need of studying varying wave length I refer to both kinds of variability.

Other Difficulties

When we admit the possibility that cycles may have varying average wave length we run into more trouble than the difficulty of distinguishing between cycles that are meaningful and those that are not. What becomes of our efforts to build systems of related cycle lengths—that is groups of cycles that have wave lengths, each of which is two or three or some other number of times the wave length of other cycles and of each other? Take the sunspot cycle length as an example. Is there a cycle twice as long? If so, is it twice as long as 11.094 years? If so, how would we know it was related if we had only the figures -160 and +677 to go on? During this period, you will remember, the sunspot cycle averaged 11.17 years, and twice 11.17 is 22.34 years, not 22.188. We would have to have the whole 1687 years before we would know the true length of the sunspot cycle—if indeed that would be its true length—or even if it has a true length! Or are cycle lengths really related and do all of them lengthen or shorten together?

If cycles have *inherently* variable length like the one drawn for you in Fig. 2 (and I suspect that at least some of them do) we get into other difficulties—this time technical. Under these circumstances how do we adjust for the cycle to get, as a residue, the other cycles which may also be present in the series? At the present time we know how to make our adjustment only on the assumption

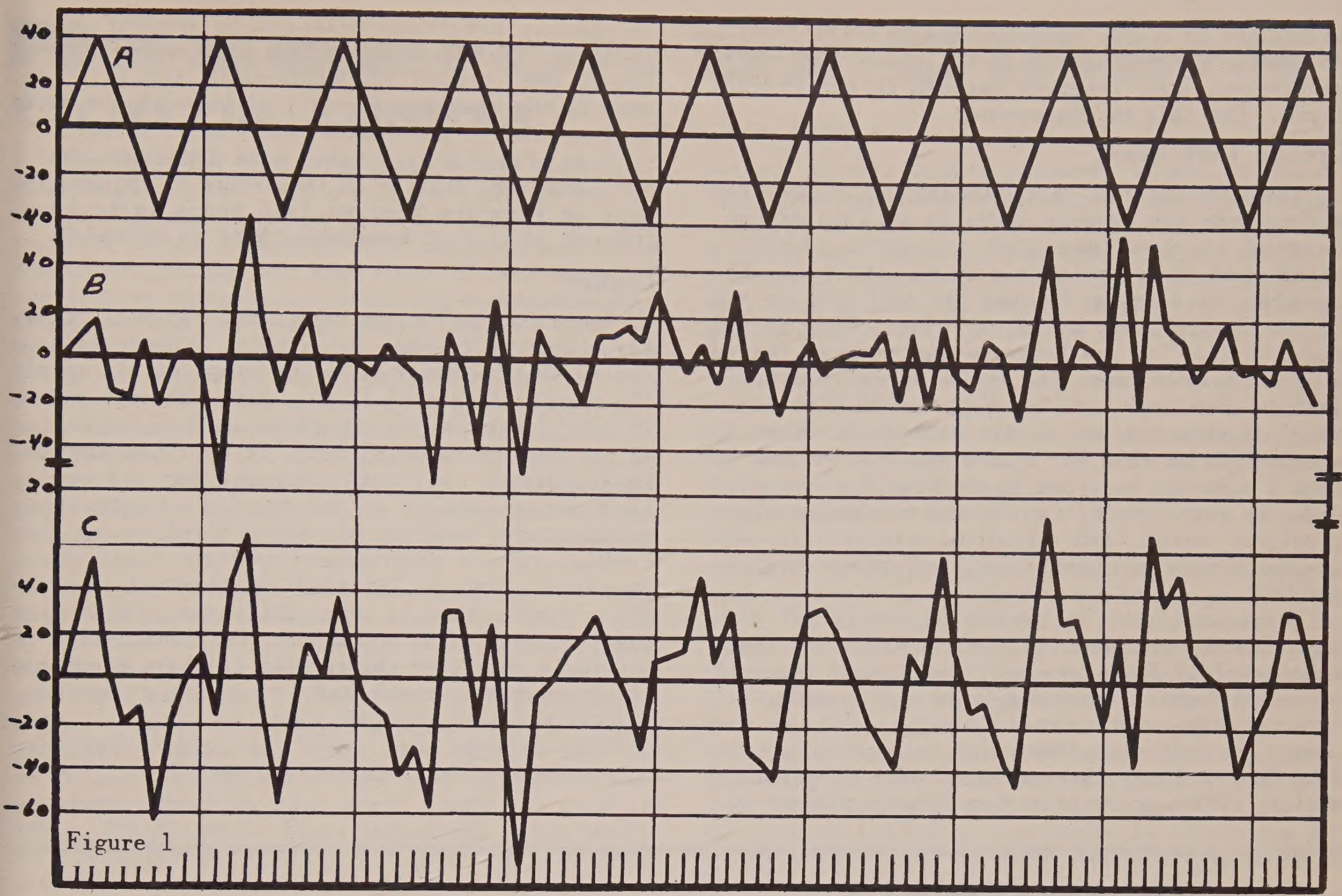


Figure 1

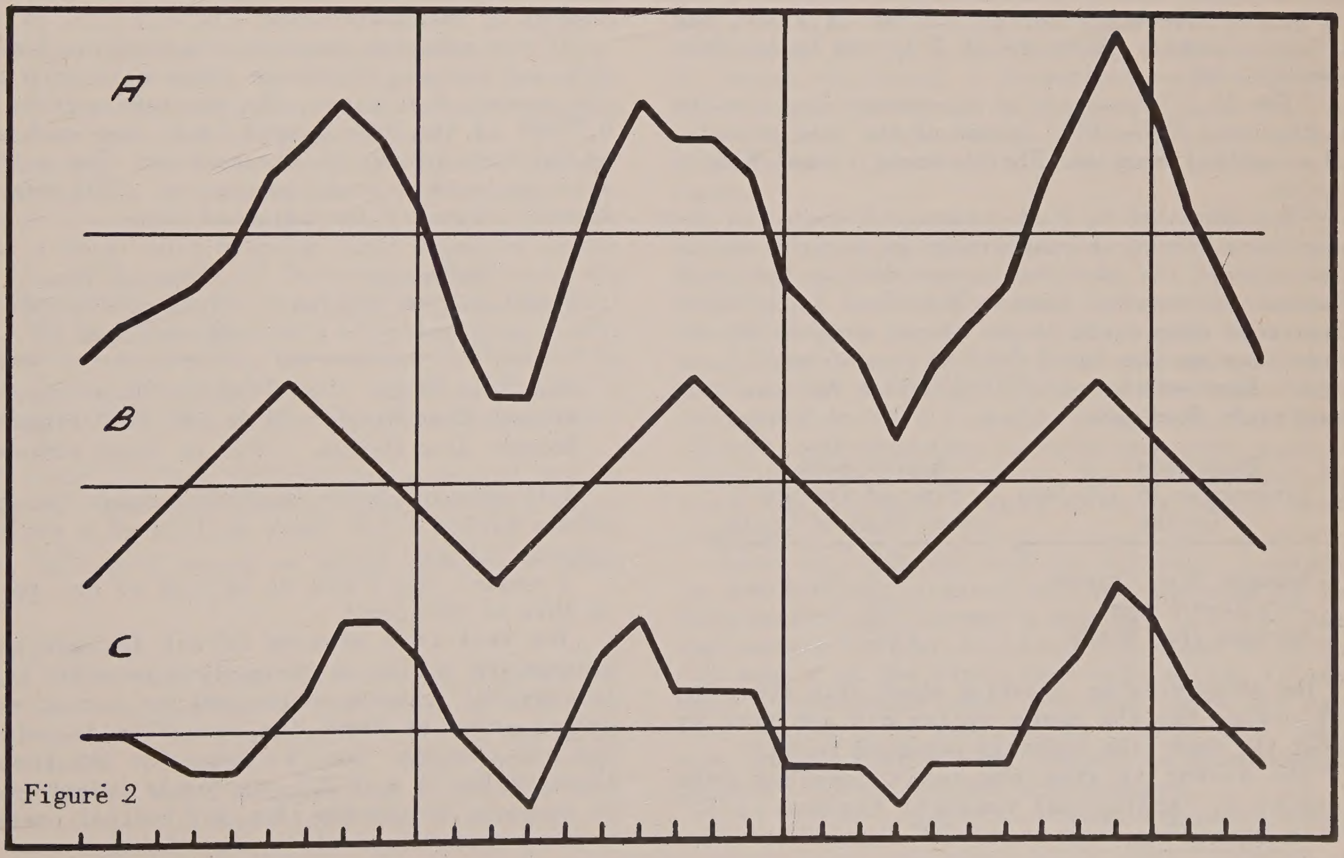


Figure 2

of uniform or slowly varying strength and or length. Any other way would seem to be impossible unless we discover some inherent pattern to the irregularity. Can this be discovered?

Cycles That Stop

The possibility that meaningful cycles can either fade out or stop suddenly is also disconcerting to those who wish a rock on which to stand—and this includes almost all of us. You remember the story of the man who fell off the top of the Empire State building. "Everything is all right so far!" he was heard to murmur as he passed a 17th story window. The cycle of wall, window, wall, window, wall, window repeated 16 more times as he flashed his way to the bottom—but then it stopped! Is it this way with cycles? With some of them I fear it is—your heart beat for example. And yet your heart, in the main, thumps along regularly enough, and certainly meaningfully too. It isn't mere accident that one thump follows another.

Having stopped, do cycles resume again? With your heart, not usually, of course. How about other cycles? Sometimes yes; sometimes, for lack of enough figures, we don't know. For example, Dr. Abbot finds that certain weather cycles are operative only when there are lots of sunspots. John Nelson finds that certain radio propagation quality cycles occur only when certain planets are in certain positions relative to another. Is it this way with other cycles that stop suddenly after having been traced for hundreds of years? If so, what is the enabling factor that permits the cycle to function? Or the factor that blacks it out?

I am afraid I have asked more questions than I have answered. This is in the nature of things. The more we know the more we find there is to know. "Of the seeking of knowledge there is no end."

Chance

There is however one very simple answer. It may have occurred to you. It is this: Suppose all the cycles that we don't know the cause of are merely the result of chance? If this were the true answer it would save a lot of trouble; but, unfortunately for our peace of mind, it is untenable too. Chance cannot reasonably account for (i) cycles that repeat scores of times, (ii) cycles that continue over hundreds of years, (iii) cycles that evidence regular geographical patterns (latitudinal passage), (iv) cycles that reassert themselves after distortion, or even abolition, (v) cycles that continue after discovery, (vi) and cycles in seemingly unrelated things that (a) have seemingly the same wave length and (b) crest at approximately the same calendar time.

This dilemma must cause the gods to snicker, but it causes cycle students to sweat!

THE 16 2/3-YEAR CYCLE

In the Director's Letter for May of 1955 I had a little summary about the 16 2/3-year cycle. This summary read as follows:

"The 16 2/3-year cycle in wrought iron prices in England, 1277—1918, is one of the best examples of a cycle I know of. Thirty-eight times! What a cycle!

"The fact that we find evidence of cycles of the same length in tree ring widths in Arizona and in Java support the idea that we are dealing here with fundamental *natural* forces. The ideal 16 2/3-year Java tree ring cycle turns almost exactly at the same time as the ideal 16 2/3-year wrought iron cycle. However the ideal 16 2/3-year Arizona tree ring cycle does not:

Phenomena Evidencing 16 2/3-Year Cycles	Approximate Time of Current Ideal High of Cycle
Wrought Iron Prices	1958.16
Java Tree Rings	1958.3
Arizona Tree Rings	1962.4

The other evening, thinking about this situation the reason why the three cycles did not turn at about the same time suddenly occurred to me.

The answer is that the table does not take account of latitudinal passage! England is 52° North Latitude, Arizona is 35° North Latitide, Java is 7° South Latitude.

If you make the necessary correction for latitude and compare thin tree rings with high prices the anomaly disappears. (As you know a cycle comes 0.7789% of its wave length later for each degree of latitude closer to the equator. For a 16 2/3-year cycle this would amount to .1298 years per degree). Here are the adjusted dates:

Phenomena Evidencing 16 2/3-Year Cycles	Current Ideal Turning Points Adjusted to 52°
Java Tree Rings	1955.81 (Thin rings)
Arizona Tree Rings	1956.58 (Thin rings)
Wrought Iron Prices	1958.16 (High prices)

This adjustment for latitude bunches the turning points within 1 1/6 years or 1/14 of a cycle from typical timing.

I wonder why I was so stupid as not to think of this at the time!

The fact that when we adjust for latitudinal passage the cycles in these three separate things—two natural science series and one social science series—come at about the same time is important for two reasons. One, it supports the idea that there really is a 16 2/3-year cycle in nature. Two, it supports the theory that latitudinal passage is a characteristic of all cycle behavior.

E. R. D.

Research by Others

CYCLES IN CONSOLS

BY E. HUGH MCDOUGALL

Eleven years ago a remarkable and certainly challenging book was published in the United States. It was unique in that the authors brought together in one volume not only the results of their own investigations but also those of many years of research by economists, scientists and others into those cyclical movements which can be traced in economic and natural phenomena, results which would not normally be readily available to the layman. It contained something of a challenge too, because they domonstrated how it was possible to isolate such cycles by a process of analysis in order that they could be studied; and that they could then be recombined, or synthesized and the resultant curve projected to give a species of prediction.

There is no doubt that forecasts made by this means can be extraordinarily accurate. In a series of articles which appeared in the *Financial Times* during the spring and summer of 1948, a writer, under the pseudonym "Rhythmist," predicted, among other things, both the decline in Government securities which has since taken place, and the exceptional potential of the last bull market in equities, *which he said would reach its peak in 1955.* (The *Financial Times* industrial index reached its all-time high of 223.9 in July of that year.)

Much of the period covered by those forecasts is now past history, and this seemed, therefore, to be an appropriate moment to try to take a further step forward in time; to endeavour in this, and in a later article, to anticipate the probable trend of Consols and Industrial Ordinary shares over rather more than the next decade.

It may help the reader to understand the underlying principle if he realizes it is possible to extract cycles from a movement which, at first sight, may appear to be entirely random. Conversely, a number of perfect rhythms (that is those having a definite time sequence) can be combined by a process of synthesis, and the figures so obtained may, when plotted on a chart, appear to follow no predestined course, the reason being the impact of these cycles on each other.

The mean of the annual highs and lows of Consols has been taken from 1823 and the price then adjusted to the level at which it would have stood had the rate of interest been 2 1/2 per cent throughout. (Consols carried first 3 per cent and then 2 3/4 per cent interest until the closing years of last century.)

Cycle analysis is carried out by constructing a number of moving averages for varying periods of time, and then by plotting the percentage by which a moving average of a lesser number of years deviates from one of a greater number of years. The latter should be approximate in length to the period of the rhythm which it is suspected may exist. This is in order that this cycle be eliminated. The length of the shorter moving average can only be decided after consideration of a number of factors including the possible existence of other cycles, and to some extent it must be a matter of trial and error.

It is impossible in an article of this scope to give detailed consideration to the construction and function of moving averages (which may be abbreviated to m.a.), but briefly, their purpose is to smooth the trend. A 3-year m.a. will take out minor movements caused by short-term political or other events; a m.a. taken of a sufficient number of years will remove all fluctuations, whatever the cause.

Editor's Note: This article first appeared in the June 20, 1958 issue of *Investors Chronicle and Money Market Review* which is the largest financial weekly in England. *Investors Chronicle* has kindly granted us permission to reprint it here. The charts illustrating the article are Mr. McDougall's and appeared in the original story in *Investors Chronicle.*

This article was followed by a second one on "Cycles in Ordinary Shares" which we will print soon.

Mr. McDougall wrote us about the articles as follows:

Dear Mr. Dewey:

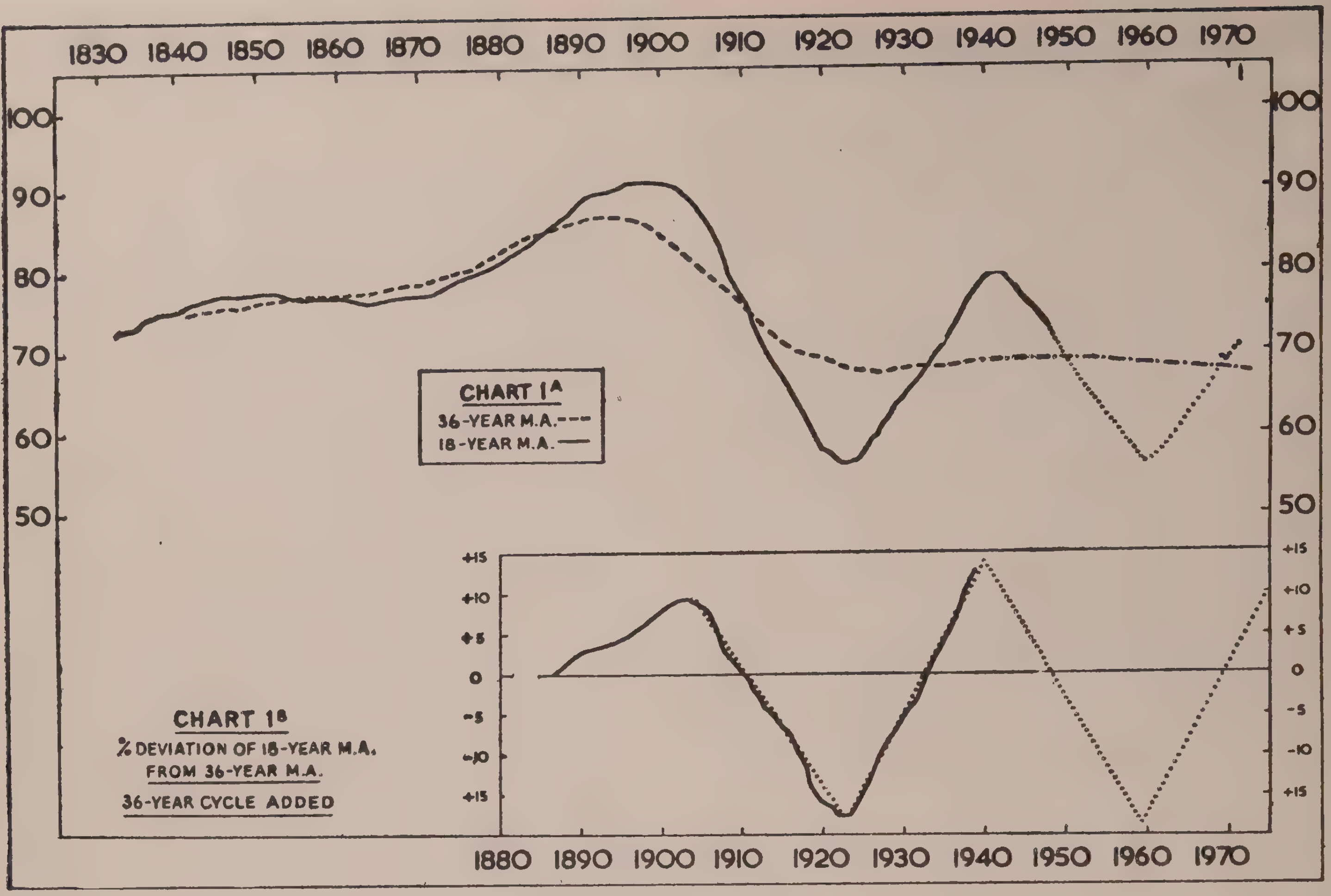
Soon after your book, *Cycles—The Science of Prediction,* was published, the series of articles which I mention (in the Consol article) appeared in the London 'Financial Times'. They interested me enormously, and I clipped and filed them and from time to time I would read them over again. I often wondered how the cycles that 'Rhythmist' had isolated were making out - *if* they were making out - and I always hoped that he would bring the whole thing up to date. However, he never did; and since no one else seemed to be in the least willing to do so, I decided that as a last resort there was really nothing for it but to try and do it myself.

I tried to get in touch with you hoping for some advice, but failed to do so at that time. So I proceeded as best I could (largely by trial and error), endeavoring to work out some sort of techniques as I went along. The fact is that beyond the obvious I knew *nothing* about cycle analysis.

Later on, when the work was finished, I managed to contact you, learned of the existence of the Foundation and became a member. I offer this explanation because it is all too clear to me now (it wasn't at the time) that this effort is very much a preliminary one, and that there are many more cycles to be isolated in both series. Then, too, it may enable your readers to more readily forgive the most obvious deficiencies.

Most sincerely yours,
E. Hugh McDougall

La Moye, Jersey
Channel Islands, England



CHARTS 1A and 1B

Although the phenomena of the trade cycle are today widely recognized and understood, it is still perhaps not so generally realized that it is only one of a number of cycles which affect both the economy and security prices; and that these interact, not only upon each other, but also upon the trade cycle itself in such a way as to increase or decrease its intensity. This must not be taken to imply that such rhythmic movements are necessarily the same in any two price series; for example, the cycles which can be traced in Consols have a different periodicity to those to be found in Industrial Ordinary shares. There is, however, one major rhythm which must first be considered because its influence can be detected in all such series, and because it provides the background to all long-term price changes.

The 54-year cycle—sometimes called the "Kondratieffe Cycle" after an economist of that name whose research threw so much light on its operation—seems, in its upward sweep, to accompany those dynamic periods in history when economic activity and development have been most marked. One such move followed the beginnings of the "Industrial Revolution" late in the eighteenth century; another the age of steam and the building of the railways in the nineteenth; and still yet a third the development of electricity for general use, the application of chemistry to industrial processes and the production of the motor-car for the masses in the first quarter of the present century. Now, with this "great rhythm" once more rising, there is the age of atomic energy.

Clearly any such period of generally increasing industrial activity must necessarily lead to some measure of capital stringency, and for this reason the directional movement of this cycle is reversed as between fixed interest securities and equities. Thus, having reached its peak for the former about 1952, it should now be falling until around 1979, and this provides the setting for the decline in Government securities over the past few years.

Chart 1A shows a 36-year m.a. of the price of Consols, with an 18-year m.a. fluctuating on either side of it, and in Chart 1B there are the same two m.a., but here the former is expressed as a base line 0, and the latter is plotted to show the percentage deviation from it. It will be seen that a cycle exists and that it approximates very closely to the 36-year period which has been added. Rhythmic peaks are shown about 1904, 1940 and 1976, and lows about 1923 and 1959. It must be mentioned that rhythmic highs and lows do not necessarily coincide with the actual peak or nadir in the price of the stock.

It can be argued that prior to about 1890 a cycle of this periodicity was not present, and that there is therefore insufficient data to prove its existence. However, there is no doubt that one has existed for nearly 70 years; and, since it shows every sign of persisting, there is no alternative but to accept it—at least until such time as evidence to the contrary becomes available. The noticeably flat trend which has been a feature of the 36-year m.a. from the middle of the 1920s is explained by the fact that when a m.a. and a rhythm are of the same, or nearly the same length, the latter is eliminated or reduced.

The 36-year m.a. can be taken up to 1939, and by means of the anticipated deviation of the 18-year m.a. from it, can be projected to 1948 and continued to 1972, allowing for the low of the 54-year cycle seven years beyond that data. This projection (which, incidentally, is the only time that judgment is used) provides the basis on which to synthesize and project the 18-year m.a.

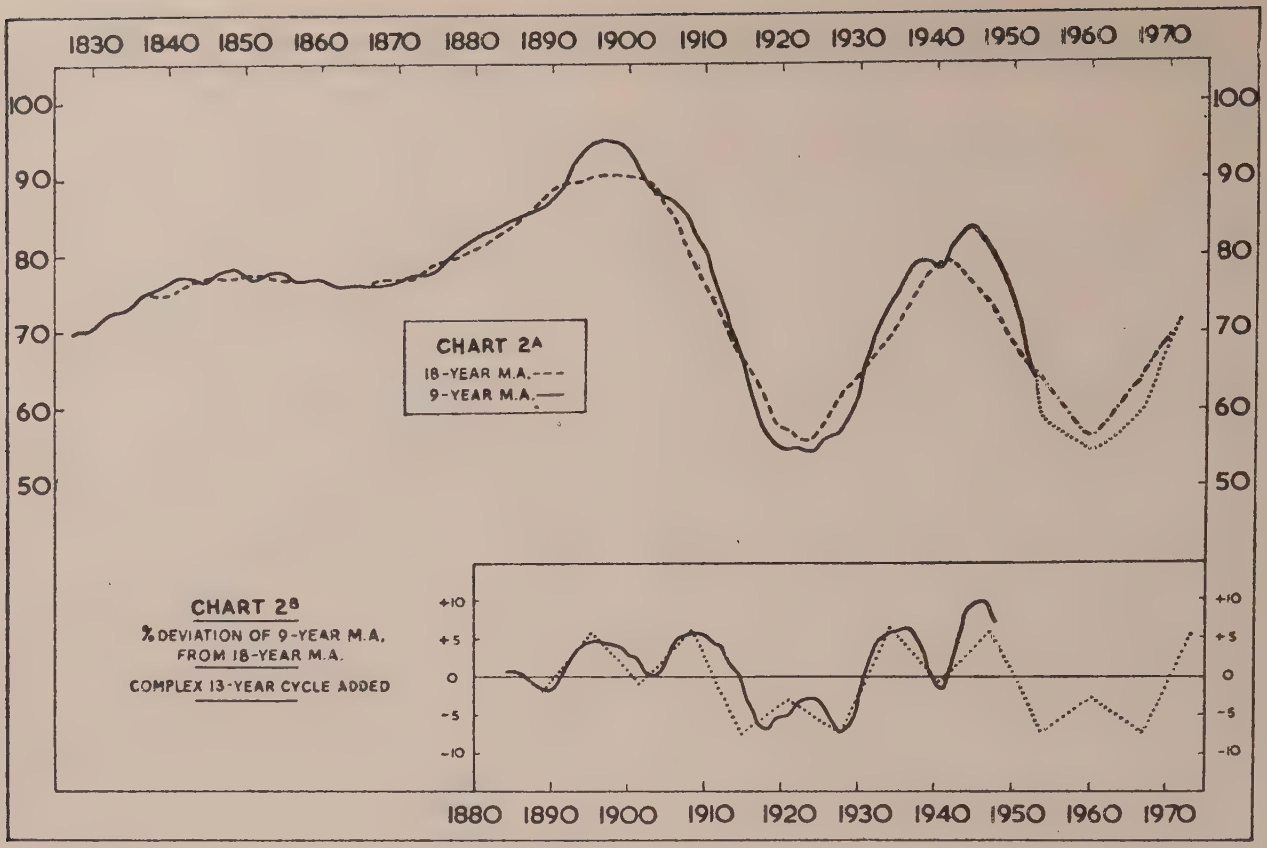
In Chart 2A the 18-year m.a. of Consols is again reproduced, but with a 9-year m.a. The percentage deviation (Chart 2B) reveals the presence of an unusual complex 13-year cycle which has major highs in 1947 and 1973, and lows in 1954 and 1967 with one intermediate low in 1960. The abnormally large deviation about 1947 was caused by the Dalton inflation period, but an inspection of Chart 2A clearly shows the cycle to be once more on track, and the 9-year m.a. has therefore been built up and projected as in the previous case.

Chart 3A once again shows the 9-year m.a. together with a 3-year m.a.—the latter being used to remove minor fluctuations, but it otherwise approximates fairly closely to the mean annual price; and Chart 3B shows the percentage deviation of the 3-year m.a. from the 9-year m.a. If the periods around 1910 and more recently are excluded, it will be seen there is evidence of a 9 1/5-year cycle.

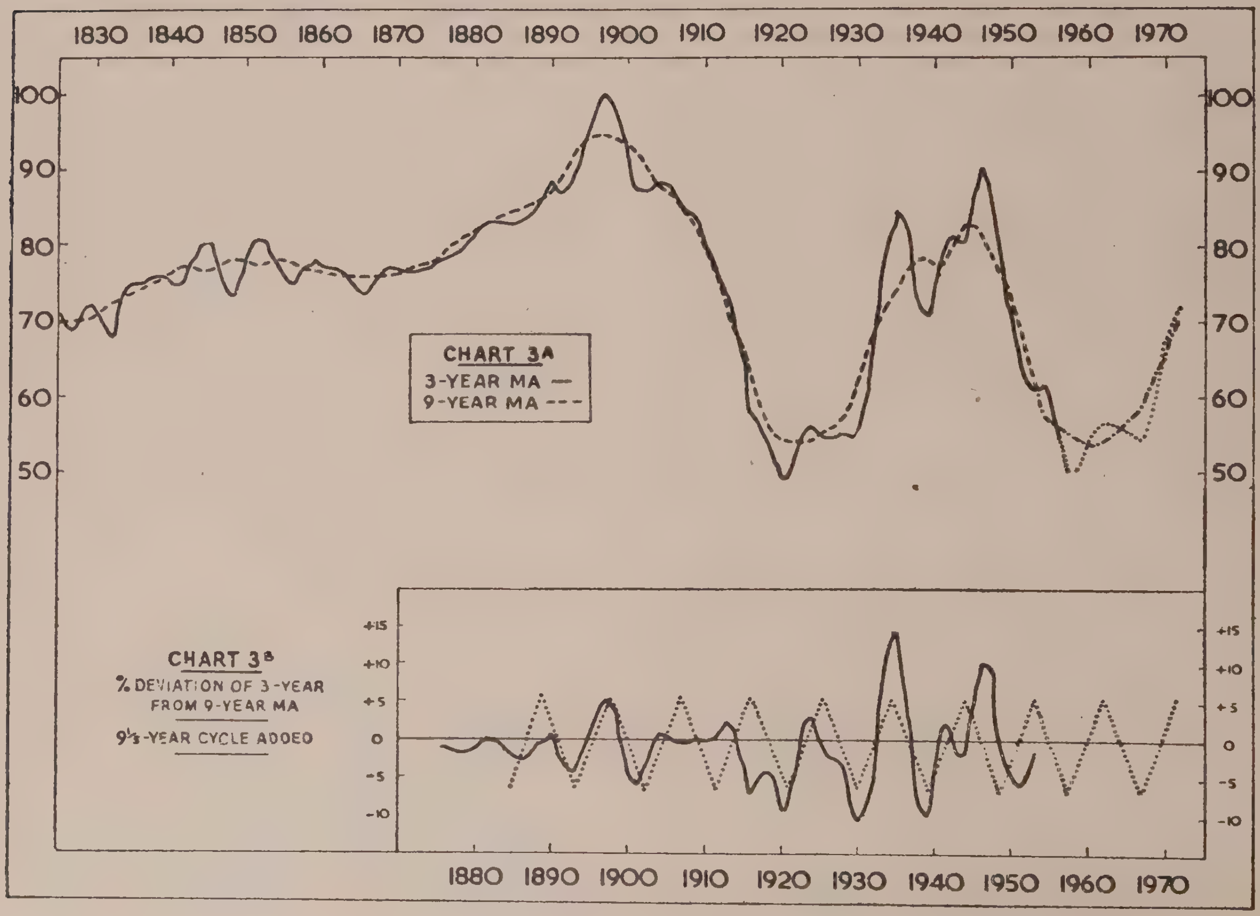
Now there is no doubt that rhythms do depart from phase from time to time, and such deviations must certainly be expected in the case of fixed interest securities which can all too easily be diverted from their true course by changes in Government policy. But although there have been instances in which cycles have developed a new periodicity, the occasions when this happens are the exception rather than the rule and it is more usual for such aberrations to prove temporary.

If it is accepted that these diversions are abnormal and not likely to become permanent, then their occurrence may even permit the observer to consider certain probabilities. By 1946, for example, the influence of war and the cheap money policy of the Labour Government had succeeded in prolonging the rising phase of Consols by as much as two years, and it would not have been unrealistic to assume that the inevitable fall, when it came, would be rapid, and that the cyclical rise due between 1949 and 1953 would be subnormal both in duration and extent as the cycle cut short this movement.

From our knowledge of the recent price level it has now clearly snapped back into phase, and on this assumption it is possible to build up the future trend of the 3-year m.a. It must be mentioned here that the resemblance between this projection and the pattern which developed around the mid-1920s is not accidental; never since that time have all the cycles (other than the Kondratieffe) been so nearly in a similar position in relation to each other. It is evident that the price of Consols has already passed its low (the rhythmic low should have occurred between June, 1957, and January, 1958, depending on the basis of calculation), and from now on, until 1962, it should gradually edge upwards. The cyclical fall due between 1962 and 1966 should be moderate in terms of price retracement, but from the latter date the rise should gather momentum. In considering this picture, however, there are two factors which must be taken into account. First, the percentage deviation of the 3-year m.a. has varied widely in the past, and on occasion has barely risen above the base line 0—in other words it has approximated to the 9-year m.a.—and for this reason the trend and price level towards the cyclical high in 1971 should, perhaps be regarded as the maximum rather than the minimum. Secondly, the 54-year cycle is not due to end its decline until about 1979 and this adverse movement will almost certainly act as a restraining influence until, in its later years, it begins to lose something of its force.



CHARTS 2A and 2B



CHARTS 3A and 3B

Technical

ADVENTURES IN FORECASTING*

BY H. K. RUTHERFORD

PART III: THE SINGLE MOVE

In the preceding articles under the above heading, general procedures were outlined by which a rhythmic series could be predicted using graphical presentation of the data. The present discussion will carry further into detail and endeavor to crystallize observations into form for practical application.

The discussion on specific forecasting techniques is divided into two sections: the forecast based on a single move in one general direction (one leg of a cycle), and the forecast based on the complete cycle. Part III is concerned only with the forecast based on the single move.

Figure 1 below represents a rhythm from origin A to completion of a cycle at C. While the figure is theoretical, it may be considered as extracted from a realistic series and the discussion is equally valid for practical application. We are concerned here with the forecast based on the move A to B on Figure 1.

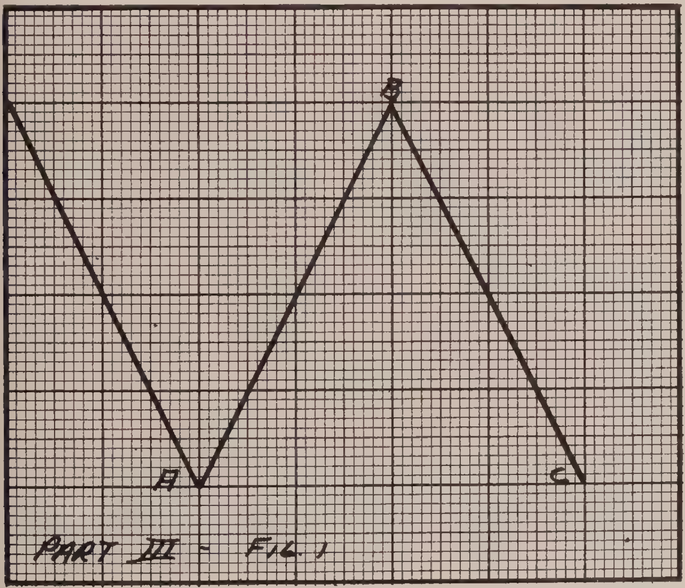


Figure 1, of course, proceeds much more smoothly between reversals than any realistic move would, and neglects minor rhythms in between. However, the extremes-reached at A, B, and C include the influence of all rhythms acting, minor as well as major, hence the predictions to be obtained therefrom will also include all rhythms.

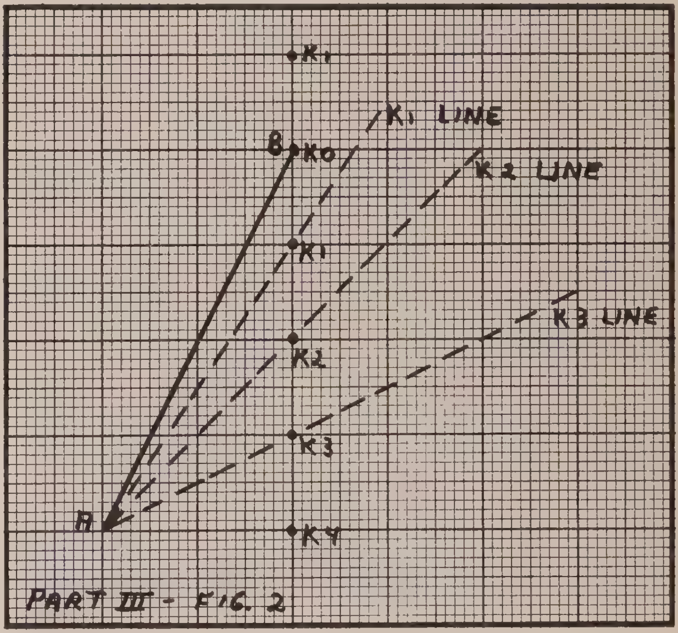
At this point it may be observed that no overall time period is involved in Figure 1, hence the observations are valid whether it be years, months, or any other. For clarity in the immediate discussion, the period is assumed sufficiently short that the influence of minor rhythms may be neglected as of little importance. In long moves, however, lesser rhythms become significant and will be so considered later.

Techniques

The techniques involved in analysis and prediction use the following tools:

K Points: K points are each one quarter of the vertical range of the move selected for prediction. They are marked on the chart above and below the end of the move and correspondingly designated outside or inside. The K points are numbered K0, K1, etc., with K0 coinciding with the end of the move. The K points are marked on Figure 2. The K1 point which is the first one below the B is K1 inside. The K1 point which is above the B is K1 outside.

K Lines: K lines are drawn from the origin of the move at A through the various K points and are correspondingly called K1,line, K2 line, etc. Figure 2 shows just the AB leg from Figure 1 with the K points and K lines added.



Intersects: Intersects are spotted on the K lines at the points where the lines cross the level of K points. Thus the point where the K2 line crosses the level of the K1 inside point is designated as the K2-K1 intersect inside. Figure 3 shows the complete chart with K points, K lines, and intersects, all based on the AB move. The intersects are marked by small circles.

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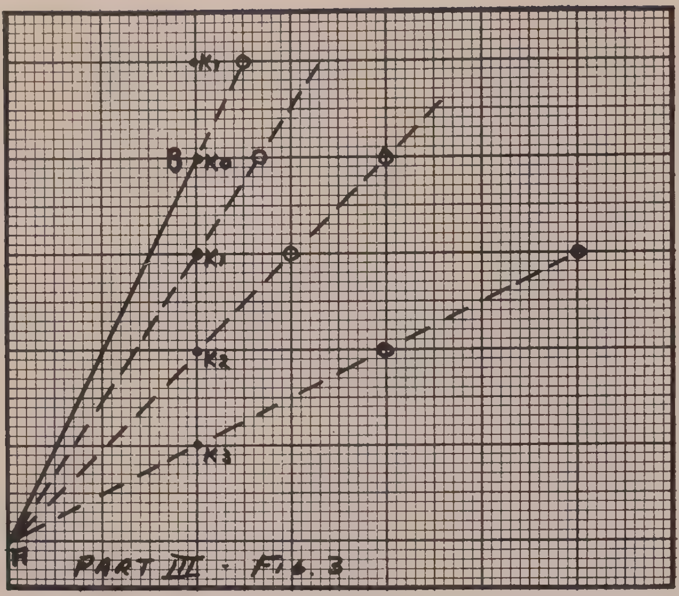


PART III - FIG. 3

You will observe that at any time during the progress along the AB line the establishment of K points and K lines would have given exactly the same K lines.

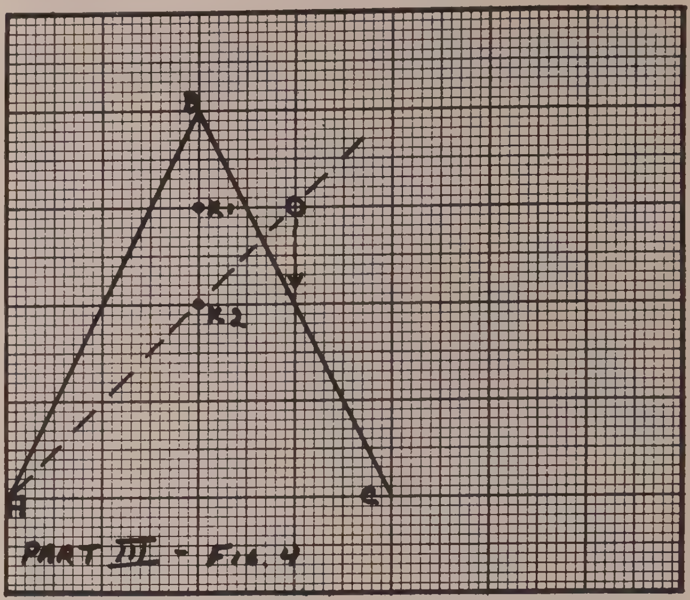
In applying the techniques, intersects will predict the *timing* of events, and K levels will establish *objectives* to serve as milestones by which to measure strength or weakness in the current progress of the curve. As will appear in the discussion, these two aspects of prediction, while maintaining a consistent pattern within themselves, have a widely varying relationship. The purpose here is to codify this relationship into observations for practical application.

Figure 3

If you assume that the AB move will reverse at B and continue uniformly in reversal to point C to complete a cycle, and if you study Figure 3 with this assumption in mind, you will reach the following conclusions about the relationships between intersects and the timing and between the K points and the levels to be expected, Such results are rarely to be expected in practice, but their tabulation furnishes valuable benchmarks.

Timing by Intersect		Level by K
AB line— K1 outside	1/4 repetition	K1
K1-K0	1/3 repetition	1/3 between K1 and K2
K2-K1	1/2 " (critical)	K2, halfway, critical
K2-K0	Full repetition	K4
K3-K2	Same	Same
K3-K1	2nd full "	K0
K3-K0	3rd " "	K4

Figure 4 demonstrates the application of this table. The chart is drawn to illustrate the third possibility listed above. If there is a reversal at point B, by the *time* the actual line has reached the *time* of the K2-K1 intersect, the curve would be (under ideal conditions) halfway through the next move, and the *level* of the curve would be at the half-way mark, or the K2 level.



PART III - FIG. 4

In the tabulation, the half-way timing and level points have been designated as critical. The reason is that it has been found from much experience that half way periods, either in timing or level, are danger points where important developments in the practical curve are probable. In the following, continual reference will be made to such points. While generally referred to as halfway, a more accurate term would be part-way, but the difference is of little concern.

These tabulated results, while theoretically 'normal', practically are very abnormal, and it becomes necessary to consider realistic departures therefrom and the implications.

Levels

In forecasting, it would seem that levels reached, as disclosing evidence of strength or weakness for the immediate future, are more important than the timing of the event. As has been stated, no invariable relationship between the two has been discovered and appears impossible of determination as long as the period and amplitude of all the rhythms combined to create the curve remain unknown. The discussion will therefore be confined to levels primarily, using the relationship for supplementary information where appropriate.

Anticipating somewhat, it may be observed here, as a general and practical statement subject to later qualification, that any move may be expected to react at least to the half-way point either in timing or level and eventually to both, not usually coincident. With respect to level, this is a critical objective, and here it is most important to prediction to determine whether the curve will reverse or will continue through for another step.

in the previous direction. In either case, the point will be dated by some intersect.

In actual practice when a reversal has occurred it is important to remember that the point is an intersect based upon two previously established K points.

Criterion

To resolve the important question of whether the curve will reverse or continue in the same direction, the following observation is made.

When the curve is in congestion or has reversed, regardless of timing or level, the problem of whether a climax has already been made or if the curve will continue further in the same direction will be answered by noting the level reached in the reaction then due. Should the curve not succeed in closing decisively through the *current K1 level,* at least one more step in the earlier direction is in prospect. But if the closing level be well through the K1 level, regardless of time, a climax has been made. Closing levels are stipulated advisedly, since they average out some minor rhythms which might otherwise be confusing.

The current K1 level referred to above is that computed on the most recent move, but this may be relatively unimportant from the long viewpoint. If one's interest is in the latter, the K1 should be computed on a longer move as far back as one wishes. The point is that the criterion is applicable whatever the length of the move.

Qualifications

The tabulation discloses 'normal' expectations from which many deviations will be found in practice. Experience indicates that the following abnormalities have useful implications.

Should the extreme level by any table, say K4, be reached at an abnormally early date, say at the time of the K1-K0 intersect, or earlier, this is a climax. Such excessive performance is caused by random influences (crises, disasters, unseasonable weather, rumors of war, etc.,), the chief effect of which appears to be only the speeding up, both in timing and level, of developments already in the making. This acceleration will be compensated for by later retardation. It has been found in practice that the usual procedures are still valid in spite of the abnormality.

Should, however, the K2 or K4 levels not be reached until after the normal date, the reaction is slow, the curve is dominated by minor influences and the eventual result may be either a reversal, or a continuation. Should predictions based on the minor rhythms be inconclusive, the application of the criterion will resolve the problem, somewhat belatedly perhaps.

After this necessary digression, we continue with predictions.

Predictions

It is well known that, realistically, any single move proceeds with minor interruptions or steps, These steps are complete cycles and, before the move reaches its climax, two, or two and one-half such cycles are the normal expectation. Thus the first cycle after the origin of the major move is not likely to be the last. But when the second move is developing, it should be suspected that the climax is near. Whether or not a final one-half step, often a precipitate move, is in prospect will be answered by application of the criterion as usual.

We are, of course, continually interested in indications of weakness or of strength in the picture as it develops. In addition to the use of K objectives for such indications, many other techniques are available, but detailing them would be redundant. Nor does it appear useful at this point to include practical applications since these would necessarily have no general application. It has been considered preferable to outline probabilities and to point out important departures from normal behavior with the corresponding implications. The problem involves too many possibilities to permit useful codification and only experience will disclose which of the procedures are adequate and satisfactory for one's purposes.

Summary

To round out the discussion of single moves, and by way of summary, the following is included:

1. Every move will eventually reach a climax and react. The *limit of reaction will be established by some K or one-half K level, of which K2 is the most common, and designated as critical.* For short moves, the K2 level may be considered as first and inevitable. In long moves, lesser fluctuations in the curve will occur before K2 is reached, if, in fact, it is reached at all. Predictions based on such lesser moves may be more convenient and in any case will include more current data than the other. The point is that forecasts based on the lesser will always interpret and agree with the action of the next (stronger) rhythm and are therefore, extremely useful supplements.
2. In practical application, it is well to note as regards timing, that intersects on the K1 line and on the K2 line supplement each other and the relationship is useful in locating one-half steps which might be overlooked. Thus where the K1 intersect establishes a date, the next following intersect on the K2 line will be half way to the second intersect on the K1 line and vice versa. Since any one of these dates may see the climax, one may well utilize these convenient indications that such a time has possibly been reached and review the situation in the light of the usual evidence to determine if further progress can be expected or if a climax has been made.
3. To avoid some of the confusion often resulting from minor rhythms, one may, of course, employ a non-detail chart from which to make predictions, and, when an important reversal is there indicated, pin-point date and level by the usual procedure applied to a detail graph of closing levels.
4. Notably when the curve reaches the K2 level and in fact, whenever it reverses regardless of level, the question will be whether a climax has been made or further progress is to be expected. The

criterion will supply the answer. Should there be a continuation, *use of a longer move for prediction is indicated,* since this is only a half-way point in the latter.

5. Barring abnormalities previously mentioned, one should expect *two or two and one-half included steps* before a move will reach its climax. At any climax, minor rhythms take over, vibrations on both sides of the objective are normal and one-half objectives often establish the limit. Hence we have the corollary that when a move in one direction, often very steep, *takes the time occupied by the complete cycle* immediately preceding, this point is the climax, Similarly, one and one-half times the period of the preceding cycle is often climactic.

6. The climax referred to above may, of course, be only a step in a still longer move—a question to be answered by application of the usual criterion.

Intersects In General

Any intersect is a timing device which dates the arrival of the curve at some rhythmic objective where action, important or otherwise, is to be expected. An intersect is usually far above or below the curve at the date and normally calls for reversal of the move immediately preceding. Being a time for action, often only cursory attention to the level is needed to determine what action is appropriate.

The exception to the above is that when the curve is at the intersect, it will continue through that level, whatever it may be.

Except for very short moves, it cannot be safely assumed that a move originating at one intersect will always continue undistrubed to the date of the next intersect on the same trend line. Where these intersects are well spaced, one can be certain that, half-way between, a reversal of possible importance will be caused by some lesser rhythm.

Conclusion

In closing the discussion relating to single moves, a few salient observations will be made to complete the record as far as it appears practicable at present.

1. Of all intersects, the K1-K1 outside often dates the most important climax. Occasionally the K1-K2 outside will be the date. Whatever the date or level, when the curve shows stabilization with two or three minor rhythms dominating the picture in a relative congestion, one should suspect that at least a half way point has been reached and that possibly a climax is being made and review the situation in the light of the criterion.

2. Half-way dates and levels often see significant reversals and successive intersects on the K1 line compared to those on the K2 line establish such dates. Thus if one dates a top, say, the nearest following on the other will be half-way along and will date a bottom, and vice versa.

3. The K lines themselves, especially the K2 line, often set the limit to moves temporarily and reaching the K levels, which is normal, will be postponed.

4. In abnormal moves, where K1 or K2 line intersect dates or these K levels have been exceeded, the K3 line intersects become appropriate, with the K3-K0 (the third full repetition of the move) establishing the time-extreme and the climax whether the level at the date be K3, K4, or some other. Ordinarily, however, an extreme objective will be reached earlier, probably not later than K2-K3 outside (two and one-half time repetitions).

Similarly, when a normally-extreme objective is reached, say K3 or K4, regardless of date, a re-appraisal of the situation is advisable.

The next section will deal with the application of procedures of forecasting to the complete cycle.

Chapter Affairs

SAN FRANCISCO

Several members of the San Francisco Chapter are making a special study of cash corn prices. This is a joint project and the group is working together to combine the result of individual findings. Although they have not yet reached the point of attempting a synthesis, they have added a short weekly cycle and a seasonal pattern to the list of cycles present in corn prices. (*Cycles* has published information on a 67-1/3-month cycle and a 3-1/2-year cycle in corn prices.)

WASHINGTON, D. C.

The Washington Chapter has scheduled future meetings for the second Friday of the coming months. As we go to press, the December meeting is scheduled for December 12.

The January meeting will be held January 9, and the February meeting will be held February 13.

The meetings are held in the Washington Post Community Room. There is no charge connected with the use of the room and the meeting is held in the evening after the dinner hour. The Washington Chapter thus has kept expenses at a minimum, with stationary and postage being about the only cash expenditure.

NEW YORK

October Meeting

Members who attended the October 14 dinner meeting of the New York Chapter heard an engrossing talk by Dr. William Dement of Mt. Sinai Hospital on the subject of "Cycles in Dreams". Many *Cycles* magazine readers will remember the feature article on this subject which appeared in May of this year in *Life* magazine. The article, entitled "Almost Everybody Has Dreams on Every Night," was based on the pioneering work in the field of dreams, performed by Dr. Dement and his senior research associate in the project, Dr. Nathaniel Kleitman of the University of Chicago. The work of these men brought to light for the first time the fact that each of us dreams in rhythmic cycles.

Dr. Dement pointed out that our nightly dreams take place at different intervals throughout the night and that, when the repetitive "dreaming" and "non-dreaming" stages of our sleep are charted, they form the familiar crest-and-trough pattern.

Editor's Note: We plan to include an article on this phase of Dr. Dement's work in an early issue.

Chapter Committees

President Dorland has invited interested Chapter members to affiliate themselves with either of the newly formed activities committees—the Cycles Workshop Committee (Samson M. Goldstein, Chairman; Willard W. Grant, Vice-Chairman) and the Market Cycles Committee (Chairman, Hugh G. Pastoriza).

The former Committee, in its present formative stage, is attempting to attract those Chapter members who have at least a limited knowledge of the techniques of cycle analysis and who are interested in: 1) learning more about such techniques; 2) sharing their own knowledge of such techniques with others; 3) working as a group on some specific problem of cycle analysis.

The latter Committee is to be a seminar group consisting of those Chapter members whose interest in rhythmic cycles is primarily in the field of stock market prices, bond market prices, or commodity market prices. This Committee is planning dinner-meetings, open to the entire Chapter membership, which will feature open discussion of market cycles in general. To help give direction to the discussion, meetings will provide a panel of several qualified individuals, each of whom will briefly explain his own interests in, and his work with, market cycles. An open question-and-answer period will follow these informal presentations.

Questions & Answers

Editor's Note: The following questions are excerpts from letters. We get many, many letters and some of the questions that are raised by members may be of general interest. Space limitations are such that only a few can be covered in any one month.

Question: I have your book, "Cycles, The Science of Prediction," On page 133, Fig. 13, you have charted the 18-year rhythm in common stock prices. Would you please send me a continuation of that projection showing the actual line also?

Answer: There were indeed five low points eighteen and a third years apart between 1860 and 1933. Further study of these figures, however, fails to disclose any valid eighteen and a third year cycle, but rather cycles about 6 and 9 years long in combination.

I suspected something of the sort in 1944. You will notice that I did not project this eighteen and a third year cycle in common stock prices.

The nine and the six year cycles, which together help to create the eighteen year tendency, are both included in the synthesis sent you. However, as they are not exactly nine and six years long respectively, they gradually get out of step with each other as time goes on.

* * *

Question: I note, in the May-June copy of *Cycles,* that on Page 117, the curve shows a decline in manufacturing production in the country extending to 1970, whereas the most recent Geisinger Indicator preliminary sheet indicates a leveling out or upturn in the Autumn. I have some ideas as to the explanation of this difference but would like to know the "official" thinking.

Answer: The 50- and 36-year cycles referred to in the May-June issue of *Cycles*, are more or less conjectural because we have not had enough experience to verify them. Even if true, however, they indicate only the general sweep of things and do not in the least preclude important upturns of a secondary nature.

* * *

Question: From Page 98 of the April, 1958, issue, under "Stock Prices" I take it that you feel that a decline in stock prices will prevail during 1959 and 1960. On the other hand I also understand you to say on Page 99 "Bond Yields" that you look for a continual rise of bond yields over the next twenty years, which to me means lower and declining bond prices over the same period.

Lower price stocks and lower price bonds lead to a perplexing problem for the investor and I want to be sure that I understand your findings correctly.

Answer: Cycles are only part of the picture and I know only some of the cycles. Moreover, some of the cycles that have been present may be merely accidental regularities and may not continue. Keeping all this in mind, it is true that the cycles we have so far discovered are downward during 1959 and into 1960—at least for the Standard & Poor's 500 stock series. In this connection, bear in mind that this projection does not include any cycles less than four years long.

In connection with bond yields, the 54-year cycle is upward at the present time and is due to continue so for the next 20 years, but this fact does not preclude many intervening ups and downs.

If I were stating the matter, I would omit the words "feel" and "prevail" and "continual," they imply an opinion and I do not have an opinion. The word prevail is too definite. The cycles are an *element* in the picture. They are a *factor* that often—in fact usually—prevails; but not always. And finally, although the longer cycles usually prevail in the end, they do not prevail in a continuous way.

* * *

Question: I have 34 years of daily figures of which I plan to make a complete cycle analysis. What procedure would you suggest?

Answer: I do not advise you to attempt an analysis of 34 years of daily figures. The detail would bog you down.

I would start by getting monthly averages, from which I would construct quarterly, semi-annual, and annual averages. From the annual averages you can get an idea of general structure. For cycles down to 2 years, the semi-annuals will do for reconnaissance. The quarterlies will do for the 1-2-year range.

If you must study short cycles, use the monthly figures for cycles down to 3 or 4 months. Study the last ten years first, then push the work back.

* * *

Question: If one wishes to measure the growth of, say, industrial production from a base period and obtain the average annual compound rate of growth (or decline), it may easily be done by use of logs. There is no problem where the original or base year is a single year.

However, supposing that the base period is the average of three years (1947-49=100), what is the correct number of elapsed years between that period and any subsequent year? Should one measure from the midyear?

Answer: If the base period is an average of three years I would use the middle year. That is, when 1947-49=100, I would call 1956 eight years from the base.

Geisinger Indicator

BACKGROUND

The Modified Geisinger Indicator is a series of numbers which, in the past, have gone up and down ahead of corresponding movements of the Federal Reserve Board Index of Industrial Production. The Modified Geisinger Indicator thus throws some light on the probabilities of the future.

The F. R. B. Index of Industrial Production measures physical production in the U. S. A. It is a weighted average of tons, yards, gallons, and numbers of things produced each month.

The Modified Geisinger Indicator is the sum of two Indicators, the Geisinger Indicator and a First Difference Indicator.

The Geisinger Indicator was invented by Robert Geisinger. It is derived from figures which are published each month in the *Survey of Current Business*. It is charted for you as Curve A on pages 22 and 23.

Curve B on these same two pages charts the First Difference Indicator, which is merely the amount by which the smoothed F. R. B. Index is above or below the value for the preceding month. The smoothing is effected by means of a centered 3-month moving average and a 2-month moving average posted to the second position.

Curve C charts the sum of the values of Curve A and B. This curve is called the Modified Geisinger Indicator. It suggests in a general way what the F. R. B. Index may do some eight months later.

Curve D charts the values of the F. R. B. Index of Industrial Production smoothed.

Curve E re-charts Curve C, advancing it by 8 months. This advance is for two reasons (1) so that you can more easily compare the past behavior of the Modified Geisinger Indicator with the behavior of the F. R. B. Index, and (2) so that you can have a better idea of what the F. R. B. Index may do in the future.

FORECAST

The Federal Reserve Board's Index of Industrial Production (after adjustment for seasonal) went up to 138 for October. This was the sixth straight month of advance in the Index since the low of 126 in April 1958. The last peak in the Index was in December 1956 when it reached 147.

The *rate of increase* in production has slowed down however. This is shown by the decline in the First Difference Indicator, which was down to +1.50 in September.

The Geisinger Indicator continued to advance in July (March 1959 when advanced), and reached +4.6.

The Modified Geisinger Indicator also went up in July (March 1959 when advanced). It reached +7.27 which may be the high point on this Indicator for the current increase.

The Geisinger Indicator signalled the increase in production when it cut +2.00 going up last May. It is not possible to tell from this Indicator how high production will go or how long it will remain high. However, the continuing high level of the Geisinger Indicator gives evidence of firmness to the current level of production.

The next signal of importance will be when the Geisinger Indicator cuts -2.00 going down. This will be a definite downturn signal.

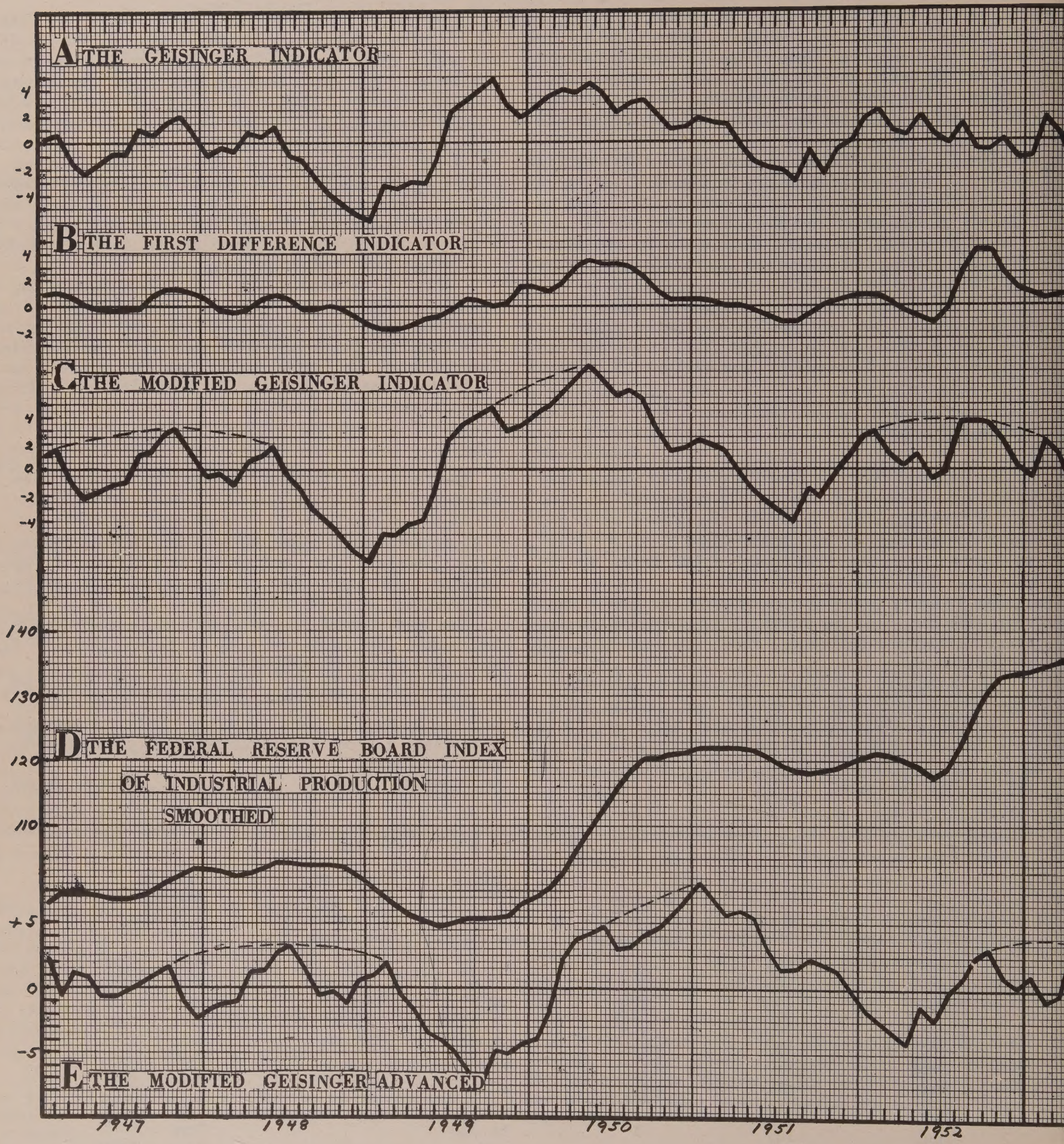
Although it is not likely that the Index of Production will continue up and up and up without any hesitation or interruption, there is not yet any reason to look for a turning to a general downward direction.

November 30, 1958 *E. R. Dewey*

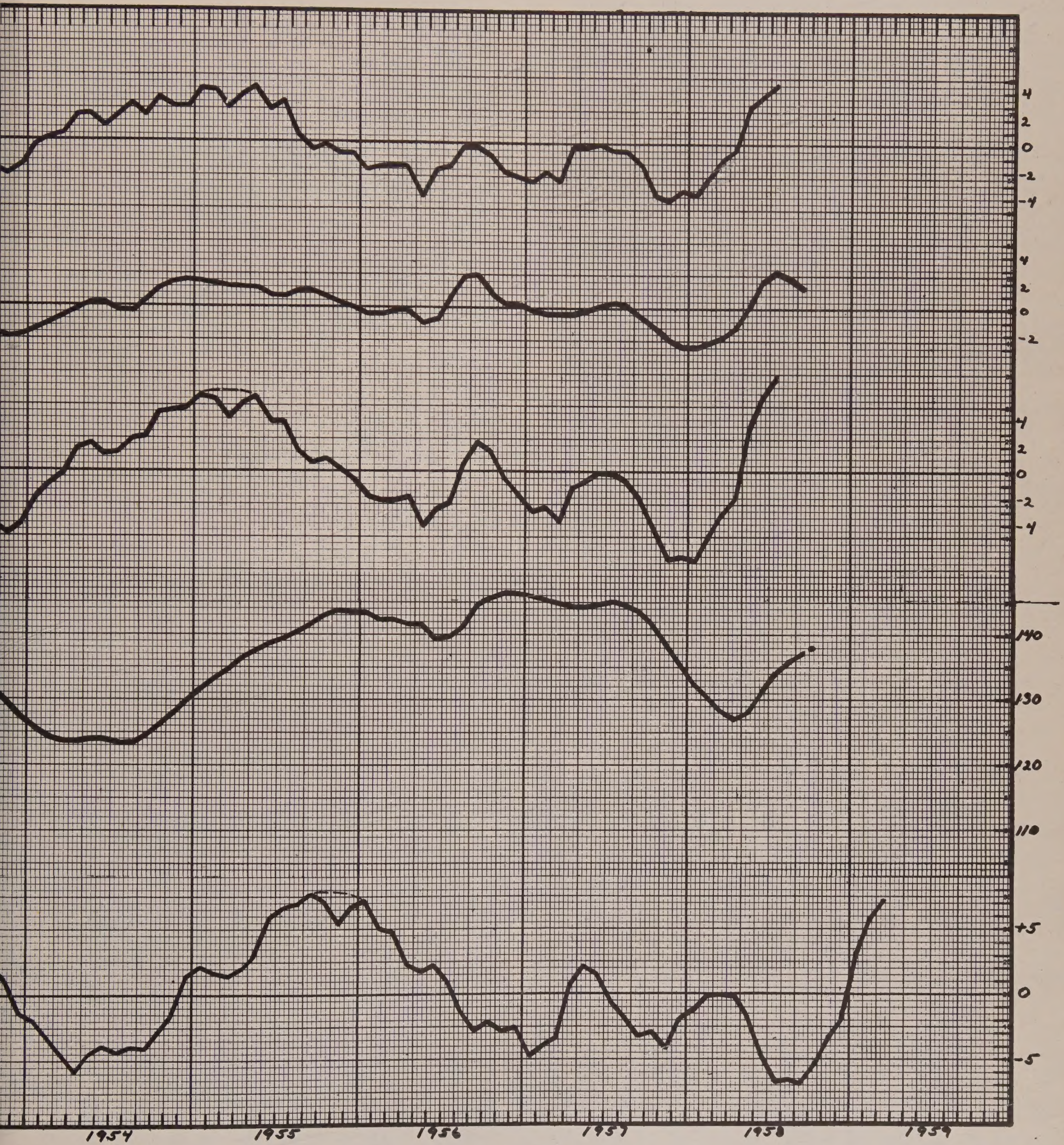
	1	2	3	4	
Month	F.R.B. Index	Geisinger Indicator	First Difference Indicator	Modified Geisinger Indicator	Timing Advanced 8 Months
Jan. 1958	133	-3.8	-3.00	-6.8	Sept. 1958
Feb.	130	-2.6	-2.66	-5.26	Oct. 1958
Mar.	128	-1.0	-2.33	-3.33	Nov. 1958
Apr.	126	-0.4	-1.50	-1.90	Dec. 1958
May	128	+3.0	+0.33	+3.33	Jan. 1959
June	132	+3.8	+2.00	+5.80	Feb. 1959
July	134	+4.6	+2.67	+7.27	Mar. 1959
Aug.	136	*	+2.17	*	Apr. 1959
Sep.	137	*	+1.50p	*	May 1959
Oct.	138p	*	*	*	June 1959

p - preliminary * - not yet available

THE GEISINGER INDICATOR



OF INDUSTRIAL PRODUCTION



Turn to page 21 for the forecast.

GLOSSAR

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Cycle, coming from a Greek word meaning circle, implies coming around to the place of beginning. Strictly speaking, in the word itself there is no necessary implication of regularity, but the word is often used loosely to denote rhythm or periodicity.

When the word cycle is modified by a time interval such as 6-year cycle, 20-month cycle, 17-day cycle, the phrase usually means a cycle that recurs with reasonable regularity. In other words, it denotes rhythm.

Rhythm, coming from a Greek word meaning measured time, implies a beat, or a tendency toward perfect regularity or periodicity. It is what we really mean on most of the occasions when we use the word cycle.

Cycle analysis, as we are using the term in this bulletin, should really be called rhythm analysis, as we are concerned with **rhythmic cycles**—cycles that recur with a beat.

Periodicity, in the strict sense, is the quality of being regularly recurrent. It is a quality not often found in nature. The ideal cycles which are often added to a chart to diagram a rhythmic cycle are true periodicities.

A **wave** is one single cycle or undulation. Waves have **frequency**, **amplitude**, **period**, and, at least when they represent harmonic curves, **phase**.

Frequency is the number of complete vibrations to and fro--i.e. waves—per second It is a term not used by cycle analysts when dealing with cycles that are over a second in length.

Amplitude is the extent of a vibratory movement measured from the average position to an extreme position; that is, it is the height or depth of the wave above or below the axis around which the wave oscillates.

Positive amplitude is the distance above the axis, **negative amplitude** is the distance below the axis, **overall amplitude** is the sum of the positive and negative amplitudes. Amplitudes may be expressed in absolute units or as a percentage of the value of the axis.

Period is the interval of time required for a periodic motion to complete a cycle and begin to repeat itself. It is the length of the wave from crest to crest or trough to trough or from some other point on the curve taken as the **epoch**. The **epoch** is the point on the curve chosen as the beginning of the wave. In physics and astronomy it is usually taken as the point where the curve crosses the axis on its upward motion, but it may be any other point as well.

Phase, in a simple harmonic curve, is the point or stage in the period to which the oscillation has advanced considered in relation to a standard position or assumed instant of starting. It is measured along the axis, usually in degrees. By extension of meaning, **positive phase** is therefore the part of the wave above the axis or trend, and **negative phase** is the part of the wave below the axis or trend. When the crests (or troughs) of two or more different series of waves come at the same time, the waves are said to be **in phase** with each other. When the crests of one series of waves coincide with the troughs of another series, the series are spoken of as in **reverse phase**.

A **simple harmonic curve** referred to once or twice above, is the curve you would get by tracing the motion of a pendulum upon a piece of smoked paper that was moving at uniform speed at right angles to the direction in which the pendulum was swaying back and forth. It
symmetrical ar
referred to as
called a **sine**

A **rectilinear** or **saw-tooth wave**, on the other hand, is a wave the sides of which are straight lines; in other words, zigzag.

Trend is the tendency of data in a series to increase or decrease during a long period of time. The expression, "a long period of time," cannot be defined except relatively. If you are dealing with hourly figures, you might consider trend as the general direction over the past 30 or 40 hours. With yearly figures "trend" might mean the general tendency over the past 100 years or more.

An **average** is a typical value which tends to sum up or describe a number of figures. There are at least five different kinds of averages commonly used by statisticians; but the one which ordinary folk think about when they hear the word **average** is the one computed by adding all the items together and dividing the total by the number of items. Thus, if we have four items, 10, 12, 11, and 13, the average of these items is 10 + 12 + 11 + 13 (46) divided by 4, or 11½. An average of this sort is more accurately called the **arithmetic mean**.

An arrangement of numbers is called a **series**.

When the numbers with which we deal represent events which occur one after another in time, the arrangement is called a **time series**. Thus, in the example above, if 10, 12, 11, and 13 represent the price of cotton for each of four consecutive years, or represent the number of accidents on each of four consecutive days, you would call the numbers by this name--a time series.

You could still average the numbers and say, for example, that the average price for all four years was 11½ cents, or that during the period there was an average of 11½ accidents per day, as the case might be.

You could also say that the average price for the first three years was 11 cents, (10 + 12 + 11 (33) divided by 3) and that the average price for the last three years was 12 cents (22 + 11 + 13 (36) divided by 3).

A **moving average** is a succession of averages secured from a series of numbers by dropping the first number (item) in each group averaged and including the next number in the series after the group, thus obtaining the next group to be averaged, and so on.

Thus, when you averaged the first three numbers of our time series (10, 12, and 11) and got 11, and then dropped the first number (10) and added the fourth number (13) and averaged again and got 12, you were constructing a moving average

Because you were averaging three items at a time, you would call the result a 3-item or 3-term moving average. If the items represented yearly values you would call the result a 3-year moving average. If the items represented daily values, you would call the result a 3-day moving average.

The **moving total** is the series of successive totals from which the moving average is computed. For example: When , above, you added 10, 12, and 11 to get 33, and then added 12, 11, and 13 to get 36 (as a step in the task of getting 11 and 12, the two terms of the moving average), you were computing a moving total.